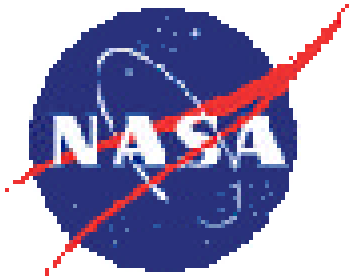

NASA Academy Strategic Plan

April 16, 2007

Contents

Letter from the Director

It gives me great pride to be part of preparing this plan along side Academy alumni, other program directors, Space Grant Consortia and its many advocates. We spent nearly a year gathering information, holding meetings, and reviewing and assembling the information contained in this document. But the end product is a valuable road map for us to follow during the next four years and a vision of the NASA Academy in the year 2010. I believe that we are well on our way to achieving the goals set forth herein and I am confident that we will not only achieve these goals, but exceed them by a measurable margin.

Beginning with Dr. Soffen in 2000, the Academies I have been affiliated with since then, and the many alumni I have come to know over the years the experience has been nothing less then impressive and inspiring. Moreover, it is my sincere hope, dream (and goal) that one day soon this unique program will be recognized for what it truly is: **a NASA institution for the development of its future leaders**.

Dave Rosage

NASA Academy Strategic Plan

Executive Summary

NASA Academy Mission

The mission of the NASA Academy Program is to strengthen the US aerospace program by attracting and guiding its future leaders.

NASA Academy Vision

The long-term future we are striving to achieve encompasses:

- Achieving long-term sustainability with integrity, remaining true to the foundational principles of the NASA Academy.
- Having a significant impact on *all aspects* of the US aerospace community as Academy alumni move through a proven pipeline to provide leadership in NASA's workforce, civil service, aerospace companies and universities.
- Instituting an effective recruitment and selection process that will attract and place a diverse pool of high-quality applicants.
- Providing demonstrated leadership as a premiere aerospace internship, model educational program, and supportive partner for other student programs.

Strategic Goals

Goal 1: Impact: Have a direct, documented impact on the US aerospace program.

1a. Make direct contributions to NASA's mission success, aerospace-related industry and academia.

Performance measure: By 2010, document alumni contributions and accomplishments to the US aerospace program. Contributions may be in terms of cost savings, risk reduction, performance improvement, scientific contribution and technical innovation, or other value-added inputs. Contributions may also be in the form of noteworthy achievements. *(See Appendix 1 – Alumni Contributions)*

1b. Contribute to the development of the STEM workforce in disciplines needed[1] to achieve NASA's strategic goals.

Performance measure: By 2010, increase number (and percentage) of alumni in the STEM workforce in disciplines needed to achieve NASA's strategic goals (from 2006 baseline).

1c. Academy alumni continue to support the U.S. aerospace program after completing the Program.

Performance measure: By 2010, increase number (and percentage) of alumni involved in education and/or professional activities that enhance US aerospace capabilities (from 2006 baseline).

Goal 2: Partnerships: Strengthen strategic partnerships with alumni, Space Grant, industry, academia and other key organizations.

Performance measures:

2a. By 2010, 90% of NASA Academy program costs are covered by strategic partners: 30% Space Grant, 50% Industry/endowment, 10% International.

2b. By 2010, strategic partners are more integrally engaged in all aspects of the Academy program, including recruitment, implementation, alumni placement, and Advisory Committee participation (from 2006 baseline).

2c. By 2010, strengthen other key partnerships with academia, professional associations and civic associations (from 2006 baseline).

Goal 3: Diversity: Help the US aerospace program workforce reflect the American population by enrolling high caliber participants that reflect the demographics of American higher education.

Performance Measures:

3a. By 2010, the percentage of Academy participants from underrepresented and underserved populations will reflect or exceed the American demographic of the total of undergraduate and graduate students. *(see Appendix 6 – Demographics of NASA Academy Participants)*

3b. By 2010, the percentage of women Academy participants will match or exceed the American demographic of the total of undergraduate and graduate students. *(see Appendix 6 – Demographics of NASA Academy Participants)*

3c. By 2010, increase the diversity of participants in terms of age, geographic and academic background, and people with disabilities (from 2006 baseline). *(see Appendix 7 – Diversity of NASA Academy Participants)*

[1] STEM disciplines/competencies needed to achieve NASA's Strategic goals defined in the NASA Competency and Aerospace Technology Qualification Crosswalk report (January 2007).

NASA Academy Strategic Plan

April 16, 2007

I. Background

The mission of the NASA Academy Program is to *strengthen the US aerospace program by attracting and guiding its future leaders.*

Founded in 1993, the NASA Academy inspires and develops future leaders with a demonstrated commitment to aerospace through a unique, powerful combination of research, leadership development, and relationship building opportunities. Filling an important niche among NASA education programs, the NASA Academy structure complements internship programs that focus more exclusively on research. The NASA Academy experience stimulates sharp young minds at a critical decision-making point in their careers.

Impact: While the NASA Academy ultimately strengthens the US aerospace program as a whole, the net benefit to NASA is the development of a highly qualified talent pool from which future employees can be selected. NASA Centers, academic institutions and aerospace companies that hire Academy alumni gain employees who have worked closely with leading scientists and engineers. Graduates of the NASA Academy Program have an enthusiastic and positive attitude that provides a strong foundation for tomorrow's aerospace leaders.

To date, NASA Academies at five Centers have produced 507 alumni (as of end of summer, 2006) many of whom have gone on to take influential positions at NASA, in the space industry, in STEM fields, and in ongoing academic research. The NASA Academy Alumni Association (NAAA), very actively supports the mission of NASA and the Academy, providing a network for alumni, and competitively awarding travel grants to students to present technical papers at prestigious conferences.

Program: The Academy entails a distinct combination of elements that define its position in NASA's portfolio of educational programs. These defining elements include:

- Providing cutting-edge research opportunities alongside NASA scientists, engineers, and educators for high caliber undergraduate/first year graduate students who have a proven interest in aerospace.
- Providing opportunities for leadership development, teamwork, and relationship building among participants and alumni.
- Connecting to communities at different places in the educational pipeline through special projects and outreach efforts, especially to underrepresented student populations.
- Linking Academy alumni to future opportunities within NASA and throughout the space program.

As college upperclassmen and first year graduate students, the highly qualified and talented Academy candidates have enough experience with space-related activities and education to allow them to fully absorb the rich experiences a NASA Academy summer provides. Often returning to NASA after experiencing another NASA program as younger students, Academy Research Associates are mature in their dedication to the space program and are exceptionally motivated.

II. Program Governance

Currently, Program authority lies with the individual Centers hosting an active Academy. Program authority is vested in the Director of the Academy at each respective Center. NASA HQ provides input, guidance and direction through the NASA Strategic Plan, Agency strategic goals, and more directly through the NASA Office of Education. NASA's Education Strategic Coordination Framework and Operating Principles provide specific guidelines for all education programs.

The NASA Academy alumni provide valuable input and active program support. The National Space Grant organizations also provide important input as a key partner, playing a major role in the recruitment, selection and funding of participants for the Academy.

NASA Academy Advisory Committee: The NASA Academy Advisory Committee was reinstituted in October, 2006. While direct authority over the Academy Program still rests with the Directors, this Committee will serve as a structured forum for discussion of relevant issues, provide input to the Directors from key partners, and strengthen alignment of all NASA Academies across the Agency.

III. Essential Elements of the NASA Academy

The following "essential elements" have been adopted in order to clearly define consistent core elements for the NASA Academy Program across all Centers:

1. **Principal Investigator-Directed Research:** A majority of the work week is devoted to a research project within a NASA science or advanced technology program. Participants work closely with a NASA PI and participate in NASA scientific and engineering work.
2. **Leadership Development:** To provide the space industry with more young professionals who have developed leadership skills in addition to technical knowledge, the Academy offers participants the opportunity to learn about and experience leadership opportunities in aerospace.
3. **Teambuilding:** The NASA Academy is structured to build strong camaraderie and network among the Research Associates, enable the students to grow into the NASA community, and gives the students additional opportunities to locate suitable careers within NASA, the aerospace industry, or academia as their careers mature.
4. **Speakers Series:** On a weekly basis, powerful historical, visionary, and/or unique leaders from the NASA community speak with the Research Associates about their work and experiences. This first-hand interaction helps students translate their technical training into professional and personal success as leaders.
5. **Exposure to the Space Program:** Participants are provided with opportunities to learn about the organizational and political structure and activities of NASA, their host Center, other relevant government agencies, the aerospace industry, and academic research institutions.
6. **Group Project:** The Research Associates develop and implement a unique group project addressing a current problem in aerospace science or engineering. This project provides hands-on experience in collaborative research, leadership and teamwork, project management within a team, and problem solving.
7. **Networking:** A valuable aspect of the NASA Academy is establishing solid links to other programs in the NASA pipeline and fostering professional and personal relationships that will benefit participants throughout their career. Participants interact with participants in other current Academies, other student programs, Academy alumni and a broad range of aerospace leaders.
8. **Strengthening the STEM Workforce:** The NASA Academy strengthens the STEM workforce by linking participants to future aerospace opportunities, and actively attracting students to graduate work and/or careers in aerospace and STEM fields.

IV. Strategic Alignment and Planning Framework

NASA Strategic Plan: The NASA Academy Program is in direct alignment with the Agency's Education Initiatives:

> *"NASA will continue the Agency's tradition of investing in the Nation's education programs and supporting the country's educators who play a key role in preparing, inspiring, exciting, encouraging and nurturing the young minds of today who will manage and lead the Nation's laboratories and research centers of tomorrow. … As the United States begins the second century of flight, the Nation must maintain its commitment to excellence in STEM education to ensure that the next generation of Americans can accept the full measure of their roles and responsibilities in shaping the future."* NASA Strategic Plan, 2006

In particular, the Program is aligned with the three major education goals defined in the 2006 NASA Strategic Plan:

- *Strengthen NASA and the Nation's future workforce*
- *Attract and retain students in STEM disciplines*
- *Engage Americans in NASA's mission*

NASA Education Strategic Coordination Framework: In turn, the program is strongly aligned with the Office of Education's three education outcomes:

- *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals*
- *Attract and retain students in STEM disciplines*
- *Build strategic partnerships*

In the fifteen-year history of the NASA Academy, a significant percentage of Academy alumni have gone on to pursue advanced degrees and/or employment as NASA civil servants or support contractors. As a proven pipeline, the NASA Academy provides significant return on investment, channeling bright scientists and engineers into the NASA and aerospace workforce, other NASA educational programs postdoctoral fellowships and other aerospace and STEM careers (see Appendix 4, p. 30). In terms of partnerships, the NASA Academy is a truly collaborative program, involving NASA centers, state Space Grants, industry partners, and alumni who provide guidance and critical manpower.

Education Operating Principles: The Academy respects and continues to strengthen its alignment with the six Operating Principles set forth by the NASA Office of Education to guide Agency programs:

1. **Relevance:** The Academy meets customer needs by supporting the research of Principle Investigators, through the research work of individual participants, through the group Project conducted by each cohort (offering direct value to Centers and Mission Directorates) and, above all, through its over-all mission impact on the aerospace program.
2. **Content** – The Academy takes utmost advantage of NASA's unique resources, including leading researchers and agency facilities.
3. **Diversity** – The Academy has demonstrated a commitment to diversity, with measurable progress and continued dedication to improvement.
4. **Evaluation** – The Academy continues to strengthen both annual and long-term program evaluation, having undergone an external evaluation in 2004.
5. **Continuity** – the Academy is strongly linked to the aerospace "pipeline" through its connections to other NASA programs and continued involvement of its alumni.
6. **Partnerships:** NASA's investment in the program is leveraged by the significant funding provided by the National Space Grant College and Fellowship Programs in the form of student stipends and travel allowances.

The Academy will incorporate these Principles into the ongoing assessments and will gather data on metrics in alignment with the NASA Office of Education.

V. Mission, Vision and Strategic Goals

NASA Academy Mission

The mission of the NASA Academy Program is to strengthen the US aerospace program by attracting and guiding its future leaders.

Each element of this mission statement embodies critical meaning:

"Strengthen the US aerospace program"

- The ultimate purpose for existence of the NASA Academy is the strengthening of America's aerospace program. By attracting and developing high caliber students who will become leaders in the aerospace community, the Academy is a direct investment in America's aerospace future.
- The NASA Academy supports mission success by developing leaders who contribute to NASA, other government agencies, academia, and industry.

"Attracting and guiding"

- The Academy program involves recruiting students and *keeping* them involved in aerospace and STEM fields for the long-term. It's not just about attracting "new people" every year – the Academy program is *consistently* alluring to those who get involved.
- In today's competitive arena there are a myriad of attractive fields for talented young people to choose from. Getting them into the aerospace fields and careers – and keeping them there – is truly a critical challenge facing the future of the US aerospace program.
- The Academy employs a very intentional mentoring and guidance program designed to support and develop these future leaders as they plan their futures and as they continue on in their careers.

"Future leaders"

- A key differentiating aspect of the Academy is a focus on attracting students who have already demonstrated both a capacity for leadership and a commitment to aerospace.
- The Academy experience, and ongoing involvement with the Academy Alumni, shapes these outstanding students as they rise to have greater and greater influence throughout their future.
- Leadership requires more than just a technical education. *Leaders* inspire others. The Academy is seeding leaders, who carry NASA's ideals, throughout the aerospace program.

"We give possible leaders a view into how NASA, the university community and the private sector function, set their priorities and contribute to the success of the aerospace program."

Gerald Soffen,
NASA Academy Founder

NASA Academy Vision

The long-term future we are striving to achieve encompasses:

Sustainability with integrity

- We will achieve long-term sustainability while remaining true to the foundational principles of the NASA Academy.
- There will be strong NASA Academy programs at several NASA Centers with a program infrastructure firmly in place, including an active Advisory Council, fully engaged Alumni Association, and full-time staff.

Significant impact

- The Academy will have an impact on all aspects of the aerospace community including NASA, other agencies, academia, industry and commercial aerospace.
- There will be a proven pipeline for Academy alumni into NASA's workforce, civil service, aerospace companies and universities, and alumni are providing leadership throughout the aerospace program.

Effective recruitment and selection

- A broad, far-reaching recruitment program will attract a diverse pool of high-quality applicants from a variety of schools, disciplines and geographic areas.
- A smooth, effective selection process will yield outstanding Research Associates (RA's) who are enthusiastic about aerospace and the NASA Academy.
- As a result of successful recruitment and partnership efforts, the Academy will be fully diverse in all aspects, including its participants, its program, and its impact.

Demonstrated leadership

- The NASA Academy will be internationally recognized as a premiere internship in the aerospace field.
- The Academy will be recognized within NASA as a model educational program.
- Other student programs will know about, support and recruit for the Academy – just as the Academy supports and recruits for them.

Strategic Goals

To achieve this Vision, we will focus on three key areas in the next five years:

Goal 1: Impact: Have a direct, documented impact on the US aerospace program.

The ultimate purpose for existence of the NASA Academy is the strengthening of America's aerospace program. By attracting and developing high caliber students who will become leaders in the aerospace community, the Academy is a direct investment in America's aerospace future. The Academy is committed to having a significant impact on the US aerospace program not only by strengthening the aerospace and STEM workforce, but also by developing leaders who utilize their Academy experience to make specific, valuable contributions to NASA and the US aerospace program as a whole.

With this in mind, the following three sub-goals (and corresponding performance measures) are established for the Program:

Note: We will evaluate against these criteria annually and use the data to view our progress. The data for the NASA Academy in 2010 will be used as a target date by which we have fully reached these goals. We will use the annual data through 2010 to indicate outcomes and trends that may inform our recruiting strategies. The cumulative data will serve to calibrate the single year data from 2010 to account for variations during a given year due to small number statistics.

1d. Make direct contributions to NASA's mission success, aerospace-related industry and academia.

Performance measure: By 2010, document alumni contributions and accomplishments to the US aerospace program. Contributions may be in terms of cost savings, risk reduction, performance improvement, scientific contribution and technical innovation, or other value-added inputs. Contributions may also be in the form of noteworthy achievements. *(See Appendix 1 – Alumni Contributions)*

1e. Contribute to the development of the STEM workforce in disciplines needed[2] to achieve NASA's strategic goals.

Performance measure: By 2010, increase number (and percentage) of alumni in the STEM workforce in disciplines needed to achieve NASA's strategic goals (from 2006 baseline).

[2] STEM disciplines/competencies needed to achieve NASA's Strategic goals defined in the NASA Competency and Aerospace Technology Qualification Crosswalk report (January 2007).

1f. Academy alumni continue to support the U.S. aerospace program after completing the Program.

Performance measure: By 2010, increase number (and percentage) of alumni involved in education and/or professional activities that enhance US aerospace capabilities (from 2006 baseline).

Such involvements may include:

- Continuing their undergraduate or graduate studies in aerospace or STEM disciplines
- Employment in direct support of NASA's mission (e.g. as a NASA employee, contractor or grantee)
- Employment in aerospace education or expansion of the public understanding of aerospace endeavors
- Employment in non-STEM related activities that contribute to NASA's mission and/or the US aerospace program

Key Strategies:

- Formalize participant and alumni exposure to opportunities for further study, competency building, co-ops, internships and research programs, and job openings (both inside and outside NASA) in STEM fields.
- Regularly update Alumni database to capture extensive, relevant data on alumni activities and contributions to the aerospace program.
- Motivate alumni to continue to participate in providing data and information to the Academy.
- Gather and assess data from Alumni database, Space Grant, and other sources to identify impacts to date and define objectives for future.
- Utilize targeted interviews to gather qualitative data on impacts (target alumni, PI's, supervisors, Space Grants, etc,).
- Incorporate "NASA Identified Competency Need Trends" in Academy selection process.

Goal 2: Partnerships: Strengthen strategic partnerships with alumni, Space Grant, industry, academia and other key organizations.

As emphasized in both the 2006 NASA Strategic Plan and the Office of Education's 2006 Strategic Coordination Framework, *partnerships* are a critical strategy toward long-term sustainability and high quality of the NASA Academy Program.

> ***"****Education investments leverage and achieve sustainability through their intrinsic design and the involvement of appropriate local, regional, and/or national partners in their design, development, or dissemination. As appropriate, key aspects of projects and activities are replicable and demonstrate potential for continuation beyond the period of direct NASA funding."*
>
> NASA Office of Education, 2006 Strategic Coordination Framework

In particular, the Academy seeks to continuously strengthen its already-established partnerships with the NASA Academy Alumni Association, the Space Grant organizations, and industry. Additionally, the Academy seeks to broaden its partnering involvements with an ever-widening circle of academia, professional and civic associations.

Performance measures:

2d. By 2010, 90% of NASA Academy program costs are covered by strategic partners: 30% Space Grant, 50% Industry/endowment, 10% International.

2e. By 2010, strategic partners are more integrally engaged in all aspects of the Academy program, including recruitment, implementation, alumni placement, and Advisory Committee participation (from 2006 baseline).

2f. By 2010, strengthen other key partnerships with academia, professional associations and civic associations (from 2006 baseline).

Key Strategies:

- Identify key individuals at partner organizations. Build relationships and strengthen engagement with Academy.
- Expand annual NASA Academy event, hosted by NAAA, to engage Space Grant, industry and other partners.
- Work with Space Grant to continue strengthening partnership.
- Work with industry partners to establish funding strategy and proposal for private sector involvement.
- Anticipate NASA oversight and policy requirements; involve key Agency staff to develop funding strategy accordingly.

- Continue to strengthen partnerships with academia, professional associations and civic associations in areas of recruitment, program participation and alumni placement.
- Hold monthly Operations Forum with Directors, alumni, and others interested in the year-by-year running of the Academy (this may become a function of an Operations sub-committee of the Advisory Committee).

Goal 3: Diversity: Help the US aerospace program workforce reflect the American population by enrolling high caliber participants that reflect the demographics of American higher education.

In the NASA Academy community, "diversity" refers to the knowledge, expertise, and unique background and life experiences offered by each individual. Diversity includes a number of important human characteristics that affect an individual's values and perceptions of self and others at work. These characteristics include (but are not limited to) age, ethnicity, gender, ability, race, sexual orientation, religion, family status, culture, geographic and academic background, and various abilities and disabilities.

We value diversity as a strength of the NASA Academy experience in providing the richness of learning that occurs in a challenging, interactive residential program. We strongly believe that future leaders in aerospace will benefit greatly from exposure to and familiarity with persons of different backgrounds, experiences and perspectives.

We support the NASA Office of Education's overarching philosophy to "Cultivate Diversity", and agree that "*The cultivation of diversity is both a management philosophy and core value for all NASA education efforts. Diversity of skills and talents needed in our future workforce is critical to our success. Potential at both the individual and organizational levels will be maximized by fostering awareness, understanding, and respect for individual differences. The knowledge, expertise, and unique back-ground and life experiences - including ethnic, gender, racial, religious, and cultural identity – of each individual strengthen the Agency*"[3]

The NASA Academy Alumni Association (NAAA) takes the lead in these efforts through the NAAA Diversity Committee. The mission of this committee is "*to develop and implement strategies to not only increase the percentage of highly qualified minorities and other underrepresented groups who are extremely passionate about space science careers to apply to the NASA Academy and other NASA educational opportunities, but also to increase significantly the number of highly qualified and active minority participants in these programs."*

The NAAA Diversity Committee will in turn be comprised of four teams:

1. **NAAA Mentoring Team – 2 types:**

    - **NA Alumni Student to Student Mentoring:** Having undergraduate and graduate NAAA Alumni working "directly" with potential students (mentees) from the recruitment process to functioning as a coach for the NASA Academy as well as other NASA educational opportunities.

[3] NASA Office of Education, NASA Education Strategic Coordination Framework - 2006

- **NA Alumni Faculty to Faculty Mentoring:** Having NA Alumni that are positioned as Academic Faculty and staff members working with other University Faculty members through the US to encourage their "star students" (mentees) to apply to the NASA Academy as well as other NASA Programs.

2. **Recruitment Team**: Ideally these team members will either reside close or within the specified regions. When a recruiter identifies a "potential" candidate, they would capture their contact information and have our NA Alumni Student Mentors shadow them until the online application has closed.

3. **Technical Team:** This team will handle the technical administrative duties of the Diversity Committee such as any data transfer, develop evaluation applications, developing and maintaining the committee's database.

4. **Strategic Planning Team:** Made up of NAAA, NASA Academy Directors and Space Grant, and Industry Representatives, this team develops the foundation of the overall theme and direction for the committee. This group is also responsible for generating and building outside partnerships for this committee.

Performance Measures:
In defining performance measures for the Academy Program, a conscious choice has been made to measure the Academy not only against the undergraduate and graduate students in STEM fields, but against those student populations at large. Thus Program leadership has intentionally challenged itself to aggressively recruit and retain a diverse participant body.

3a. By 2010, the percentage of Academy participants from underrepresented and underserved populations will reflect or exceed the American demographic of the total of undergraduate and graduate students. *(see Appendix 6 – Demographics of NASA Academy Participants)*

3b. By 2010, the percentage of women Academy participants will match or exceed the American demographic of the total of undergraduate and graduate students. *(see Appendix 6 – Demographics of NASA Academy Participants)*

3c. By 2010, increase the diversity of participants in terms of age, geographic and academic background, and people with disabilities (from 2006 baseline). *(see Appendix 7 – Diversity of NASA Academy Participants)*

Key Strategies:

- Support and expand the NAAA Diversity Committee's collaborative effort to develop a continuous annual campaign to advertise the NASA Academy to underserved populations.
- Continuously strengthen recruitment efforts to broaden outreach.
- Strengthen partnerships with relevant Professional Societies and minority serving institutions.
- Partner with Space Grants and support them in their efforts to recruit diverse candidates.
- Strengthen efforts to support individual candidates, with awareness of needs of underrepresented and underserved populations.
- Partner with key NASA offices and programs to collaborate on recruitment and selection, with attention to underrepresented and underserved populations.

Glossary of Key Terms

- **Program Plan:** A comprehensive operational plan that covers all aspects of the Program, including governance, essential elements, and year-by-year Program implementation.
- **Strategic Plan:** Long-term (5 years), future-focused plan, focusing only on *transformational* issues.
- **Mission:** Core purpose; reason for existence
- **Vision:** Compelling, inspiring picture of the ideal future *(not "measurable" per se)*
- **Strategic Goals*:** Long-term outcomes that will have a significant impact on the effectiveness of the Program.
- **Performance measures*:** Measures of success in achieving strategic goals
- **Annual performance measures*:** Challenging yearly targets leading to achievement of strategic goals and performance measures.
- **Baselines, trends:*** Data-based definitions of current state (2006) and historical trends, used to determine long-term and annual performance measures.
- **Diversity:** The knowledge, expertise, and unique background and life experiences offered by each individual, including their ethnicity, gender, race, religion, culture, age, geographic and academic background, and exceptional needs.

**Definitions drawn from OMB's Program Assessment Rating Tool*

Appendix 1: Academy Alumni Contributions and Accomplishments

Risk Reduction Contributions	
2006	1. Chris Lewicki (GSFC '96) Sponsoring Space Grant: Arizona - contributed to the success of the Mars Rovers Spirit and Opportunity serving as flight director at JPL
	2. Matt Lacey (ARC '99) Sponsoring Space Grant: Kansas - managed reliability enhancements for the RD-180 rocket engine selected to power the government's Atlas V launch vehicles.
	3. Jake Lopata (GSFC '95) Sponsoring Space Grant: Illinois - founder and CEO of Space Launch Corporation, designed and tested a new launch vehicle (a spin-off from his Academy's Group Project) named Rapid Access Small Cargo Affordable Launch (RASCAL) vehicle. Some of the key technologies for RASCAL were validated through testing, which significantly reduced technological risk.

Performance Improvement Contributions	
2006	1. Michael Vachon (ARC '98) Sponsoring Space Grant: Kansas - supported two highly successful flights of the X-43A Hypersonic Scramjet, the first flights of an airframe-integrated scramjet engine at Mach 10 and Mach 7. The data generated in these two flights more than doubled the entire database of data that had been obtained through wind tunnel research and will continue to benefit industry and academia for decades to come.
	2. David Goldstein (GSFC '95) Sponsoring Space Grant: Rhode Island - grew an innovative small satellite company (AeroAstro, Inc.) from 20 to 85 people in 4 years as the VP for Business Development - named fastest growing technology company in the State of Virginia.

Scientific Contributions	
2006	1. Enectali Figueroa (GSFC '95) Sponsoring Space Grant: Puerto Rico - developed the first Position-Sensitive X-ray Imaging Microcalorimeter at GSFC.
	2. Lee Richardson (GSFC '96) Sponsoring Space Grant: West Virginia - conducted ground-based observations of the transiting extrasolar planet HD 209458 b, and by looking for the secondary eclipse, was able to place limits on the structure of the planet's atmosphere.
	3. Melissa Kirk (MSFC '97) Sponsoring Space Grant: Kansas - discovered the main belt asteroid 48237 while performing follow up observations of Near Earth Objects (NEOs).
	4. Craig Lewandowski (GSFC '05) Sponsoring Space Grant: Minnesota - discovered sedimentation of cylindrical particles and degradation rates of nanoparticle solutions.
	5. Karen Knierman (GSFC '99) Sponsoring Space Grant: Arizona -

	Using images from the Hubble Space Telescope, discovered star clusters forming in the tidal debris of galaxy mergers. These clusters could be important contributors to the halo of galaxies or material between galaxies.
	6. Bethany Ehlmann (ARC '02), Sponsoring Space Grant: Missouri - as part of the Mars Exploration Rover Science Team's daily operations, helped direct where the rovers traveled and identified rocks which at both landing sites have indicated evidence for past water (shallow evaporating water at Meridiani)
	7. Josh Alwood (ARC '03), Sponsoring Space Grant: California - discovered the first undoped material to be described by the Millis/Moriya theory of non-Fermi liquid materials (low temperature, condensed matter physics)
	8. Frank Centinello (GRC '06), Sponsoring Space Grant: New York - was selected as crew member for Mars Desert Research Station (MDRS) team in Hanksville, Utah. He was the Crew 54 Geologist and Astronomer.

Technical Innovation Contributions	
2006	1. Michael Vachon (ARC '98), Sponsoring Space Grant: Kansas - was awarded a patent with a fellow researcher for the design and development of an advanced fiber-optic flow angle probe that has applications from propulsion and aerodynamics research, to power-generating wind turbines, to natural gas pipelines.
	2. Gabriel Hoffman (ARC '01), Sponsoring Space Grant: Wisconsin - developed the control system for Stanford University's autonomous vehicle, "Stanley", which won the DARPA Grand Challenge (a $1 million dollar prize).
	3. Aaron Jacobovits (DFRC '98), Sponsoring Space Grant: Maryland - was the key co-inventor of US Patent #6,598,195: Sensor Fault Detection, Isolation & Accommodation at GE Aircraft Engines.
	4. David Goldstein (GSFC '95), Sponsoring Space Grant: Rhode Island - was the co-inventor of US Patents for "Orbit Transfer Vehicle with Support Services" and "Aerobraking Orbit Transfer Vehicle".
	5. Jake Lopata (GSFC '95), Sponsoring Space Grant: Illinois - was the inventor of two patents: 1) Transpiration Cooling of Rocket Engines, filed September 6, 2001, approved August 13, 2003, US Patent 6,606,851 and A System for the Delivery and Orbital Maintenance of Micro Satellites and Small Space-Based Instruments, filed March 27.
	6. Todd Crowley (GSFC '94), Sponsoring Space Grant: New Hampshire - was the inventor of two patents; # 6,041,383 - Establishing control of lock token for shared objects upon approval messages from all other processes and # 6,141,720 - Method and apparatus for coordination of a shared object in a distributed system.
	7. Danielle Merfeld, Ph.D. (GSFC '96),Sponsoring Space Grant: Illinois - was the inventor of two patents: RD29304-1 – Ultraviolet light emitting diode with carrier concentration enhancement by infrared illumination,

	and 125168-1: Development of novel photovoltaic cell using stable Cu20 nanocrystals and conductive polymers.
	8. Mark Rentschler, PhD (GSFC '01),Sponsoring Space Grant: Nebraska - has been co-awardee of several patents issued and/or in the process of being issued: "Robot for Surgical Applications," U.S. Patent #7,126,303; issued October 24, 2006; "Surgical Camera Robot," U.S. Patent application filed April 13, 2006; "Natural Orifice Surgery with an Endoluminal Mobile Robot," U.S. Provisional Patent application filed June 22, 2006.

General Noteworthy Accomplishments	
2006	1. Ruth Jones (MSFC '94), Sponsoring Space Grant: Arkansas - is the second African American woman to receive a PhD in Physics in the state of Alabama.
	2. Eric Anderson (GSFC 95), Sponsoring Space Grant: Virginia - CEO of Space Adventures, Ltd., co-founded the company in 1997 with several leading visionaries from the aerospace, adventure travel and entertainment industries and has led the company to several years of profitable success, selling more than $120M in space tourist flights; including the first and only four tourists to fly to the International Space Station. The fifth space tourist, Charles Simonyi, Ph.D., is scheduled to launch on April 9, 2007 onboard Soyuz TMA-10 en route to the International Space Station (ISS).
	2. David Goldstein (GSFC '95), Sponsoring Space Grant: Rhode Island developed and ran the first Space Horizons conference in 1996 in Boston; co-founded Encounter 2001, later Team Encounter, to send human DNA from paying customers on a solar sail out of the solar system; helped found Cryptodynamics, an internet security company.
	3. Michael Vachon (ARC '98), Sponsoring Space Grant: Kansas - authored and co-authored 20 papers, three of which won "Best of Conference" recognition awards as well as invitations to speak at the Royal Aeronautical Society in London, England; the International Space Planes and Hypersonics Systems and Technologies Conference in Caserta, Italy; and the Graduate Aeronautics Laboratory at the California Institute of Technology in Pasadena.
	4. Matt Lacey (ARC '99), Sponsoring Space Grant: Kansas - was awarded a Presidential Management Internship at KSC.
	5. Ben Hood (ARC '2000), Sponsoring Space Grant: Arkansas - served on the ST5 Flight Dynamics Team which planned three spacecraft maneuvers of three spacecraft over a 90 day period.
	6. Jennifer Barney (GSFC '98), Sponsoring Space Grant: Vermont - authored and/or co-authored 10 space-related papers and tutored more than 50 middle school students as a JPL employee.
	7. Laura Kvarnstrand (Thackray)(MSFC '97), Sponsoring Space Grant: Idaho - has been part of the team developing two applications to the European Patent Office (EPO): "Vehicle seat belt arrangement", EP 1

	591 327 A1; "A child seat for a vehicle", EP 1 712 404 A1.
	8. William Pomerantz (GSFC '02), Sponsoring Space Grant: Massachusetts - currently serves as Director of Space Projects for the X-Prize Foundation; he currently manages all of the foundation's new prizes in the area of aerospace. Mr. Pomerantz also serves as an officer of the Space Generation Foundation, a member of the Steering Committee for the Space Exploration Alliance, and co-founder and editor of SpaceAlumni.com – an online news and networking tool for young space professionals around the world.
	9. NAAA Annual Event was officially affiliated with the X-Prize Cup in October 2006. NAAA has also established collaborations with International Space University and SEDS, and has initiated partnership with NSBE-Space.

Appendix 2: Academy Alumni in STEM Workforce

STEM Development Performance Measures					
Year	**Total Number of Alumni**	**Total Number of Alumni in STEM Workforce**	**Percentage of Alumni in STEM Workforce**	**Total Number of Alumni in School**	**Percentage of Alumni in School**
2006	507	318	63%	155	31%
2007					
2008					
2009					
2010					

Appendix 3:
Academy Alumni Mapped to Projected Competency Needs

The following table lists fields of study (academic majors) of Academy alumni mapped to NASA's latest projected competency needs. Accordingly, some fields of study are expected to increase and others decrease in the FY2006-2009 and FY2010-2011 timeframes. The following legend represents the number of Full Time Equivalent work-years of effort (FTEs) expected, increasing (+) or decreasing (-) in the respective years.

Expected FTE Range	Symbol Representation
0 - 50	+/-
51- 100	++/--
101 – 150	+++/---
151 – 250	++++/----
251 – 400	+++++/-----
Over 400	++++++/------

2006 Academy Alumni Fields of Study & NASA Workforce Competency Trends[4]

Number	Field of Study	Total Number of Alumni	Total Number in Workforce	Projected Need (+/-)	
				FY2006 thru FY2009	FY2010 thru FY2011
1	Aeronautical and Astronautical Engineering	34	20	++++	+
2	Aerospace Engineering	78	39	++++	+
3	Aerospace Science	1	1	++++	+
4	Aerospace Systems Design	1	0	++++	+
5	Applied Math/Physics	5	3	+++	+
6	Astrogeophysics	1	1	+++	+
7	Astronomy and Astrophysics	12	5	++++	-
8	Astrophysics	4	3	+++	-
9	Atmospheric Science	1	1	++++	+
10	Atomic Physics	2	1	+++	+
11	Automotive Engineering	1	1		
12	Aviation Systems	1	1	+++	+
13	Biochemistry	5	3	+++	+
14	Bioengineering	1	0	++++	+
15	Biology	15	9	++++	+
16	Biomedical Engineering	8	5	+++	+
17	Biomedical Sciences	1	1		

[4] NASA Workforce Competency Trends – Projected increases/decreases (+/-) in accordance with NASA Workforce Strategy Report dated April 28, 2006 – Analysis of Future Competencies Needed to Support NASA's Missions. Number of +'s or –'s indicative of increased or decreased need.

18	Chemical Engineering	10	5	+++	+
19	Chemistry	8	4	+++	+
20	Civil Engineering	4	4	+++	+
21	Cognitive Neuroscience	1	1		
22	Communication, Culture and Technology (see Note 1 at end of table)	1	1		
23	Computer Engineering	5	3	++++	+
24	Computer Science	11	5	++++	+
25	Computational Neuroscience	1	1	++++	+
26	Dentistry	1	1		
27	Earth and Environmental Engineering	1	0	+++	+
28	Earth and Planetary Science	7	3	++	+
29	Earth and Space Science	1	0	++	+
30	Earth Science	3	2	++	+
31	Education	2	1		
32	Electrical and Computer Engineering	4	2	+++	+
33	Electrical Engineering	39	23	+++	+
34	Electronics	1	1	+++	+
35	Elementary Particle Theory	1	1	+++	+
36	Engineering Management	3	2	+++	----
37	Engineering Mechanics	6	3	++++	+
38	Engineering Physics	4	3	++++	+
39	Engineering Science	3	3	++++	+
40	Engineering Artificial Intelligence	1	1	++	++
41	English	1	1		
42	Environmental Engineering	5	3	++++	+
43	Environmental Science	4	2	+++	+
44	French and Physics	1	1	++++	+
45	Geological Engineering	2	2	+++	+
46	Geological Sciences	21	12	++	+
47	Geography	3	3	++	+
48	Global Health	1	1	++	+
49	Industrial Engineering	1	1	+++	+
50	International Business and Economic Development	2	2	++++	-
51	Law	1	0		
52	Linguistics	1	1		
53	Master in Business Administration	8	5	++++	-
54	Materials Science	2	1	++++	+
55	Math	9	5	+++	+
56	Mechanical Engineering	88	49	++++	+
57	Medicine	5	3		
58	Music	1	1		
59	Neuroscience	1	1		

60	Ocean Engineering	1	1	+++	+
61	Operations Management	1	1	+++	-----
62	Optical Science	2	2	+++	+
63	Organizational Leadership	1	1		
64	Physical Chemistry	1	1	+++	+
65	Physical Geography	1	1	+++	+
66	Physical Science	1	1	+++	+
67	Physical Therapy	1	1		
68	Physics	81	48	+++	+
69	Physiology	1	1		
70	Planetary Science	4	0	+++	+
71	Polar Studies	1	1	+++	+
72	Psychology	2	2		
73	Remote Sensing	1	1	+++	+
74	Science Writing	1	1	+	+
75	Science, Technology and Public Affairs	1	1	++	-
76	Solar Physics	1	0	+++	+
77	Space and Communication Science	1	1	+++	+
78	Space Operations	1	1	++++	+
79	Space Science	2	1	++++	+
80	Space Studies	5	2	+++	+
81	Space Systems Engineering	1	0	+++	+
82	Systems Engineering	5	3	+++	+
83	Statistics	3	2	+++	+
84	Technical Management	3	2	+++	-----
85	Telecommunications Engineering	2	2	+++	+
86	Zoology	2	0	+++	+
TOTAL		**573***	**336**		
			18 Non STEM		
			318 STEM		
Note 1: All highlighted fields of study are considered non-STEM fields of study					
*** Total number (573) exceeds total number of alumni because it counts alumni with multiple degrees in different fields of study multiple times (i.e. multiple competencies)**					

Because the above competency information is mapped to fields of study, it does not in itself clearly characterize the work needing to be performed, or not. For example, a competency such as Program Management can be accomplished by most engineering or science professionals with the right experience. So if NASA needs program managers, a wide variety of engineers or scientists with the right experience could fill the position. What is projected is a shifting of competencies between now and FY2011 (post Shuttle era), retraining and redistribution of existing workforce, and an overall reduction of 8% in FTEs from 18410 in FY2006 to 16900 in FY2011. Moreover, a significant FTE reduction is expected in management and paraprofessional (business/financial/IT) competencies in FY2010 and beyond.

Appendix 4: Academy Alumni in STEM Fields

Academy Alumni whose Career or Educational Endeavors Enhance the U.S. Space Program			
Year	**Total Number of Alumni**	**Total Number of Alumni involved in Aerospace Program or STEM**	**Percentage of Alumni involved in Aerospace Program or STEM**

2006	507	• 379 degree'd alumni
		  • 163 BA/BS
		  • 153 MS/MBA
		  • 63 MD/PhD
		• 41 NASA Civil Servants
		• 75 Aerospace Contractors
		• 16 Education/Teachers
		  • 1 Elementary
		  • 9 High School
		  • 6 College
			• 75% degree'd alumni
			  • 32% BA/BS
			  • 30% MS/MBA
			  • 12% MD/PhD
			• 8% NASA Civil Servants
			• 15% Aerospace Contractors
			• 3% Education/Teachers

2007			
2008			
2009			
2010			

Appendix 5 – Partnerships Measures

Performance measure:

2a. By 2010, 90% of NASA Academy program costs are covered by strategic partners: 30% Space Grant, 50% Industry/endowment, 10% International.

2006 Funding Source Distributions	2010 NASA Academy Goal
2006 NASA Academy at Goddard ▪ Space Grant Consortia….31.5% ▪ PIs…… 17.5% ▪ International…… 10.0% ▪ Program…… 41.0% 2006 NASA Academy at Marshall ▪ Space Grant Consortia.. 44.4% ▪ PIs…… 55.5% 2006 NASA Academy at Glenn ▪ Space Grant Consortia.. 27.0% ▪ PIs…… 60.0% ▪ Program…….... 13.0%	(overall average) ▪ Space Grant Consortia….30.0% ▪ International…….. 10.0% ▪ Industry/Endowment…….50.0% ▪ PIs…… 5.0% ▪ Program…….. 5.0%

Performance measure:

2b. By 2010, strategic partners are more integrally engaged in all aspects of the Academy program, including recruitment, implementation, alumni placement, and Advisory Committee participation (from 2006 baseline).

2006 involvement:	2010 Goal:
Alumni: • Active in recruitment process, selection and during program sessions • Promote the Academy at respective academic institutions • Serve on selection committees • Volunteers serve on diversity and interview committees • Alumni coordinator informs alumni of program activities and encourages their participation	• Active in recruitment process. • Directly involved in the selection process and during program sessions. • Actively involved in recruiting corporate and academic sponsors. • Promote the Academy at respective academic institutions • Serve on selection committees • Volunteers serve on diversity and interview committees • Alumni coordinator informs alumni of program activities and encourages their participation.
Space Grants: • Generally support the Academy by participating in review, score and	• Fully support the Academy by participating in recruitment, review,

selection, stipend support, and round trip travel support to the center where students are selected • In 2006, contributed 31.5% of GSFC Academy cost in the form of stipends + R/T	score and selection, stipend support, field trip participation, and round trip travel support to the center where students are selected • Contribute 30% of Academy cost in the form of stipends + R/T
Principal Investigators: • Participate in review and scoring of candidates • Optionally contribute towards Academy RA or program expenses. • In 2006, contributed 17.5% of GSFC Academy cost	• Participate in review and scoring of applicants • Optionally contribute towards Academy RA or program expenses • Contribute 10% of Academy cost
Industry: • Participate in review and scoring of candidates • Optionally contribute towards Academy RA or program expenses. • In 2006, contributed 2.0% of GSFC Academy cost.	• Participate in review and scoring of applicants • Optionally contribute towards Academy RA or program expenses • Contribute 5% of Academy cost

Performance measure:

2c. By 2010, strengthen other key partnerships with academia, professional associations and civic associations (from 2006 baseline).

2006 involvement:	2010 Goal:
Academia: • Generally support the Academy by participating in program promotion, particularly for underrepresented minorities.	• Actively support the Academy by participating in program promotion, particularly for underrepresented minorities.
Professional Associations: • Generally support the Academy by participating in program promotion, particularly for underrepresented minorities.	• Actively support the Academy by participating in program promotion, particularly for underrepresented minorities.
Civic Associations: • Generally support the Academy by participating in program promotion, particularly for underrepresented minorities.	• Actively support the Academy by participating in program promotion, particularly for underrepresented minorities.

Today

Program - Coordinate development of online application system, solicit PI placement opportunities to all NASA Centers hosting Academies, directly involved with program administration and staffing, and execution of the 10 week session (In 2006, contributed 41% of GSFC Academy cost).

International - Participate in recruitment and pre-selection process. Fully-fund ($10K) international student representative selected (In 2006, contributed 10% of the GSFC Academy cost (2 RAs)).

2010 SCENARIO

Program - Coordinate development of online application system, solicit PI placement opportunities to all NASA Centers hosting Academies, directly involved with program administration and staffing, and execution of the 10 week session (contribute 10% of Academy cost).

International - Participate in recruitment and pre-selection process. Fully-fund ($12-20K) international student representative selected (10% of the Academy cost).

Space Grant Foundation - Administers Academy endowment fund to support/supplement all NASA Academy Programs, as needed (50% of Academy costs). Also moderately supports financial needs of the NAAA and NASA Academy Advisory Committee.

NASA Academy Advisory Committee - Meets bi-annually during space grant meetings. Serves as advocate for the Academy by raising awareness of the Academy to industry, space grants and academia. Reviews existing processes and suggests improvements.

Appendix 6 – Demographics of NASA Academy Participants

3a & 3b:

Demographics of NASA Academy participants:

	US Degrees (02-03)*	2004	2005	2006	NAAA Overall
Men	42.1%	11 (34%)	14 (39%)	25 (58%)	288 (57%)
Women	57.9%	21 (66%)	22 (61%)	18 (42%)	219 (43%)
White	66.8%	23 (72%)	28 (78%)	35 (81%)	411 (81%)
Black (UM)	9.1%	3 (9%)	5 (14%)	3 (7%)	43 (8%)
Hispanic (UM)	6.7%	1 (3%)	1 (3%)	4 (9%)	21 (4%)
Asian / Pacific Islander	5.7%	3 (9%)	2 (6%)	1 (2%)	28 (6%)
Native American (UM)	0.8%	2 (6%)	0 (0%)	0 (0%)	4 (1%)
TOTAL		32 (100%)	36 (100%)	43 (100%)	507 (100%)
Under-represented Minority (UM)		6 (19%)	6 (17%)	7 (16%)	68 (13%)

***SOURCE:** U.S. Department of Education, National Center for Education Statistics. (2005). *Postsecondary Institutions in the United States: Fall 2003 and Degrees and Other Awards Conferred: 2002-03* (NCES 2005-154).

Appendix 7 – Diversity of NASA Academy Participants

3c. Increasing diversity of participants by:

Age:

	2004	2005	2006	2007	2008	2009	2010	NAAA Overall
Under 20	0	0	0					6
Between 20-25	30	35	40					492
Between 26-30	1	1	1					5
Over 30	1	0	2					4

Geographic background:

Region (# states)	2004	2005	2006	2007	2008	2009	2010	NAAA Overall
Western (19)	11	12	12					152 (30%)
Mid Western (8)	6	9	8					83 (16%)
New England (7)	4	7	6					76 (15%)
Mid Atlantic (7)	5	4	7					84 (17%)
South Eastern (11)	4	3	8					101 (20%)
International	2	1	2					9 (2%)

Academic background:

Principle Field of Study	2004	2005	2006	2007	2008	2009	2010	NAAA Overall
Engineering	13	21	24					262 (52%)
Math	0	0	1					9 (2%)
Computer	4	0	1					16 (3%)
Physical Science	12	10	16					114 (22%)
Life Science	2	2	0					77 (15%)
Education	0	0	0					2 (1%)
Other	1	1	1					27 (5%)

People with Disabilities:

	2004	2005	2006	2007	2008	2009	2010	NAAA Overall
Vision	0	0	0					0
Hearing	0	1	0					1
Mobility	0	0	0					0
Fine Motor /Dexterity	0	0	0					0
Other	0	0	0					0